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## DV360, Third Party Exchanges, and Outcome-Based Buying

emaani@ and schoenfeld@

## **Agenda**

### **The Plan**

- What is DV360?
- Impact of advertiser optimizations on DV360
  - Shift from manual bidding to optimized bidding
  - Shift from spending on 3PE to Adx
- What does the future hold?

## DV360 (formerly DBM)

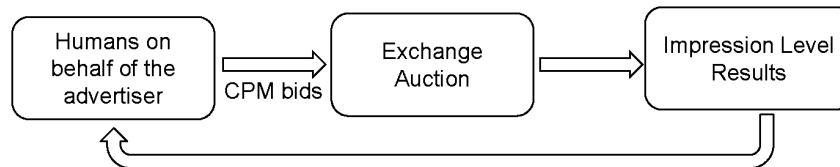
- Bidding platform for our largest advertisers
- Acquired as "Invite Media" in 2010 for \$81M.
- \$7B+ this year up from <\$1B in 2014.
- Still growing at nearly 30% YoY.



Budget and third party inventory numbers from Rasta, month of September.  
Consider a stat to show head-heaviness if I can get one, i.e. Top N advertisers make up XX% of spend

## DV360 Two Years Ago

- 83% of spend using manual bids
  - DBM acting primarily as infrastructure
  - Autobidding product existed, but didn't have much advertiser trust
- Almost half the spend was on exchanges running auctions with unfair pricing
  - Auctioneers charging something other than 2nd price
  - Publishers setting up complex series of auctions for the same ad opportunity

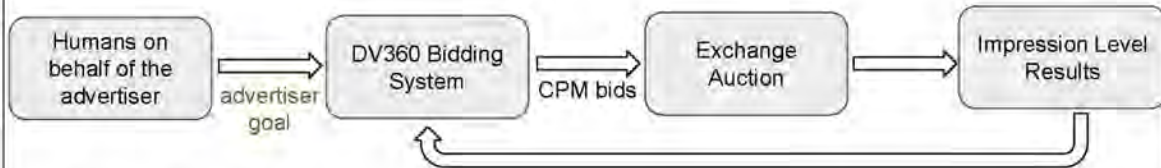


In this talk we will tell you how we changed this story.

## How We Modernized DV360

### Two Major Efforts

- Manual bidding reinvented to protect advertisers from unfair auctions
- Autobidding systems completely revamped



### Huge Resulting Shifts

- Autobidding adoption up from 17% to 40%
- Revenue moved to exchanges that don't engage in pricing shenanigans
  - AdX for example grew from 45% to 70% of total DV360 spend

## Reinventing Manual Bidding

**Before:** CPM bids are a set of instructions from the advertiser. We leave it to them to achieve their goals.

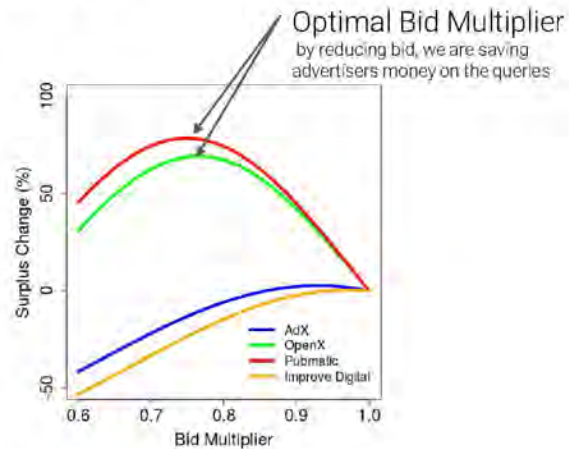
**New:** CPM bid is the "value" the advertiser expects to get from that impression. We will help them optimize for it, protecting them from auction shenanigans.

- Example: Poirot
- Example: Elmo

Note that in the old way, DV360 primarily plays the role of "pipes".

## Poirot

- Algorithmic framework to **detect and quantify** deviations from second price auctions using DBM data
- Bidding mechanism to **optimize bids** based on the input from the above framework
- Helps the advertiser win the same impression at a lower price in non-second-price auctions



Note that in the old way, DV360 primarily plays the role of "pipes".



## Elmo

- DBM is over 80% budget constrained
- Every query, a budget constrained ad participates in the auction with some budget throttling probability
- Exchanges have learned to exploit this arrangement using the idea of “multiple calls”
  - This a bid discovery mechanism, where we submit a random ad each query and the winner is the one with the highest bid
  - Makes the exchange look bigger than it is to trick the budget server

Note that in the old way, DV360 primarily plays the role of "pipes".

## Elmo

- Project Elmo leverages cookie based budget throttling to ensure more consistent prices for similar queries
- Every minute, we fix the advertisers that can purchase any query from a given cookie (budget throttling based on  $\text{cookie} \times \text{time\_bucket}$ )
- We bid the same across multiple calls since they occur close to each other in time



-25% spend on Pubmatic, for example.

## Revamping Autobidding

In autobidding the advertiser tells us their goal explicitly instead of leaving us to infer it from the CPM bid. The advertiser has to treat us like a black box.

Most popular example: *"maximize conversions subject to budget"*.

### **We completely rebuilt our autobidding systems over the last two years:**

New System for Predictions: PEAR Army

- in-house ML system for per advertiser models

New System for Bidding: HDMI

- similar to GDN tech with enhancements for DV360

Prediction launches +60% value a same spend level.  
HDMI launches

## Performance Comparison

### Advertiser Goals

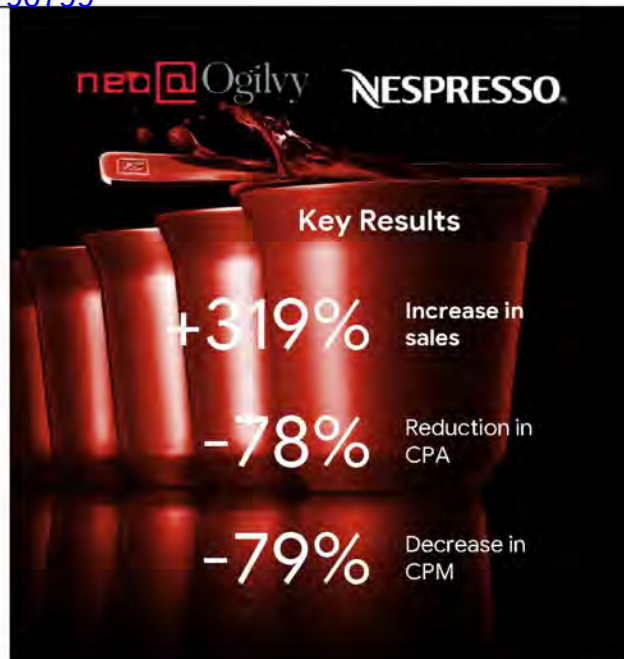
- Increase sales
- Reduce the time that traders spend optimizing campaigns

### Measurement Approach

- Run A/B tests to compare the results of automated vs. manual bidding

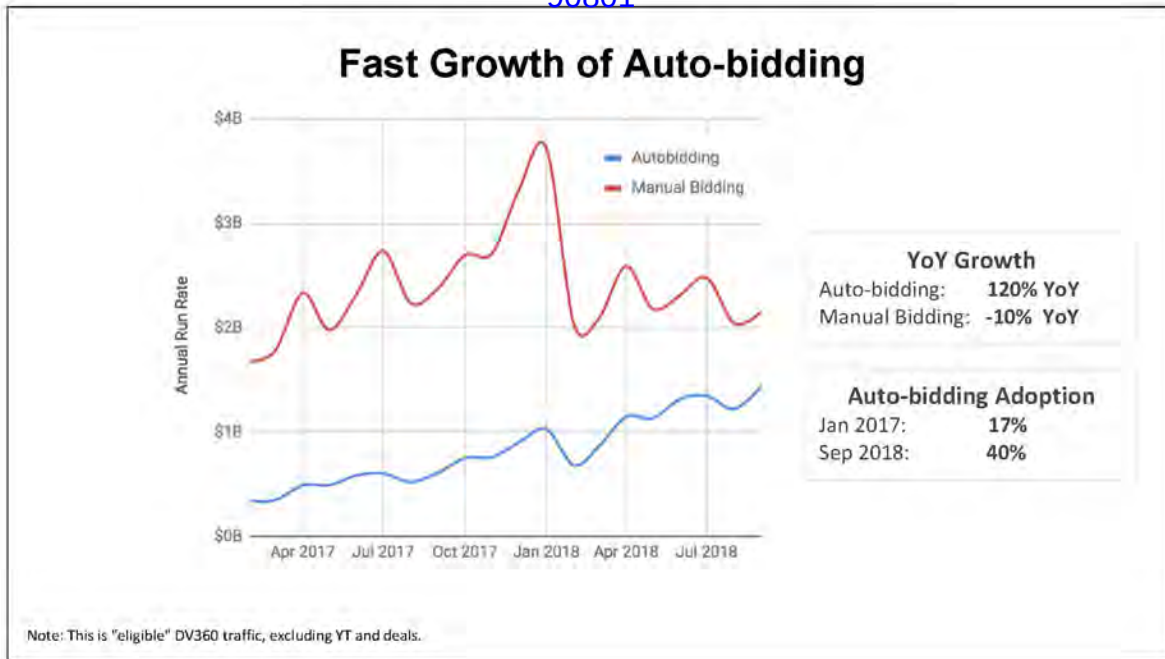
### Results

- Across 7 H2H tests we saw an average uplift of **over 100%** in advertiser value for same spend
- Efficiency gains also reported, 10 hours per person per month in one case!



H2H tests.  
Get anecdote about fewer hours.

## **Driving Changes in the Market**



Data.

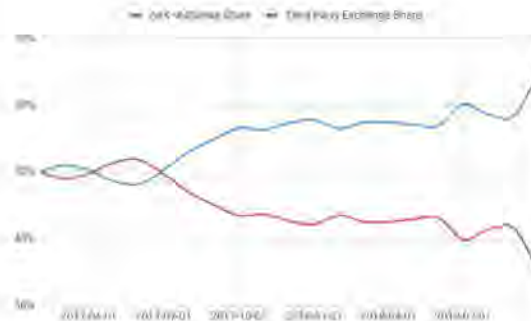
## Shift toward AdX and Other Clean Exchanges

Bidding optimizations on unfair exchanges helped level the playing field.

This caused a revenue shift towards exchanges who don't engage in such shenanigans.

Launches such as these contributed to

- Adx + AdSense growing from 45% to 70% of DV360 spend over this period
- +\$130M in profit for Google

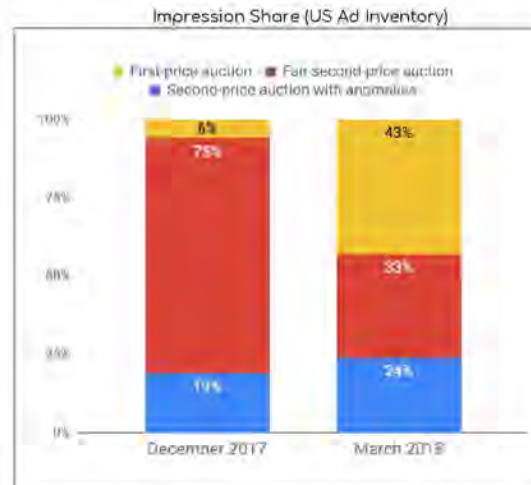


Sources:

<https://www.emarketer.com/content/nearly-half-of-programmatic-impressions-are-sold-through-first-price-auctions>  
<https://pubmatic.com/wp-content/uploads/2017/08/PubMatic-UnderstandingAuctionDynamics.pdf>

[https://dasnav.corp.google.com/v/displaynav/#dimensions=QI\\_DIM\\_ExtendedBuyerNetworkId:DBM|DBM\\_on\\_AdX,QI\\_DIM\\_SellSideBreakdown:EXCHANGE\\_TRAFFIC&dimensions=QI\\_DIM\\_SellSideBreakdown:ADX\\_SELLER|AFC|AFD|EXCHANGE\\_TRAFFIC|GMAIL|MOBILE\\_APP&dimensions=QI\\_DIM\\_SellSideBreakdown:ADX\\_SELLER|AFC|AFD|GMAIL|MOBILE\\_APP&end=2018-10-01T00:00:00&granularity=month&history\\_id=1&metric=QI\\_MET\\_ValidTotalCostUSD&start=2017-01-01T00:00:00&values\\_relative\\_to=1&view=displayglobal](https://dasnav.corp.google.com/v/displaynav/#dimensions=QI_DIM_ExtendedBuyerNetworkId:DBM|DBM_on_AdX,QI_DIM_SellSideBreakdown:EXCHANGE_TRAFFIC&dimensions=QI_DIM_SellSideBreakdown:ADX_SELLER|AFC|AFD|EXCHANGE_TRAFFIC|GMAIL|MOBILE_APP&dimensions=QI_DIM_SellSideBreakdown:ADX_SELLER|AFC|AFD|GMAIL|MOBILE_APP&end=2018-10-01T00:00:00&granularity=month&history_id=1&metric=QI_MET_ValidTotalCostUSD&start=2017-01-01T00:00:00&values_relative_to=1&view=displayglobal)

## Market shift to More Transparent Auctions



Everyone was practically running first price auctions, so they became more transparent about it.

Sources:

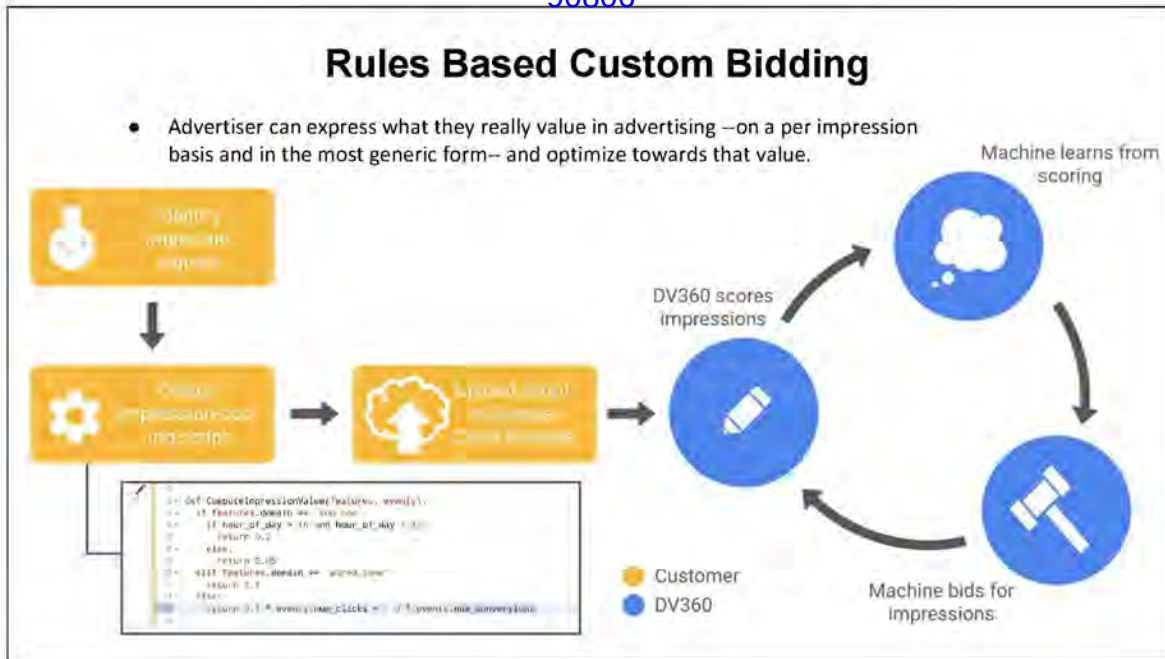
<https://www.emarketer.com/content/nearly-half-of-programmatic-impressions-are-sold-through-first-price-auctions>

<https://pubmatic.com/wp-content/uploads/2017/08/PubMatic-UnderstandingAuctionDynamics.pdf>



**Innovations that will drive the trends in 2019**

**New Product:  
Rules Based Custom Bidding**



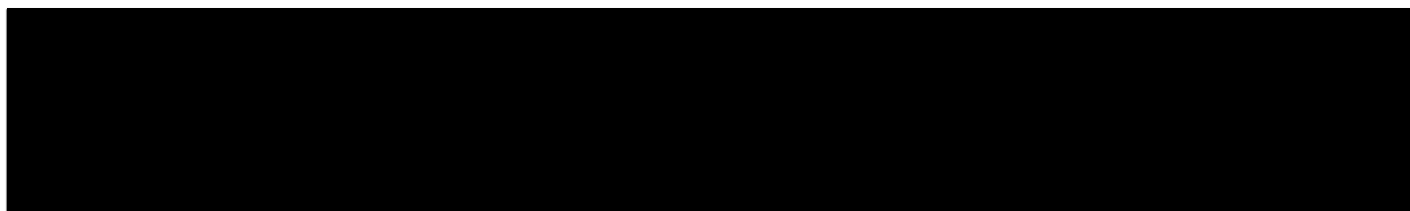
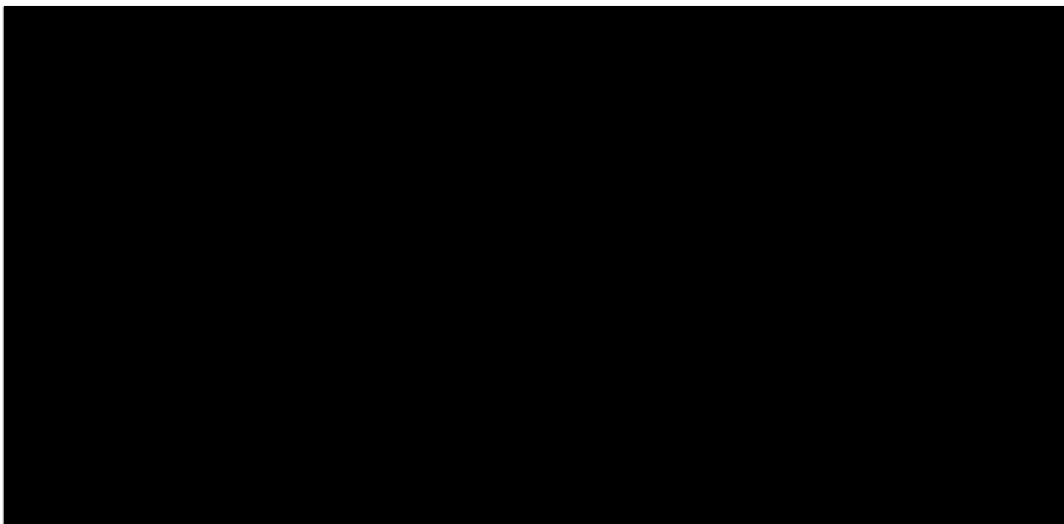
Rule based custom bidding is a new bidding strategy that we are building together with the KIR team. It allows our advertisers and agencies to express what they really value in advertising and optimize towards that value. This bidding strategy allows them optimize beyond views, clicks, and conversion. The first step is to find out what features or signals in a query is important to them. Many advertisers and agencies already know that and use it in fixed bidding with complex targeting, we want to change that. Once they know what features and signals they need, they can

2) Write a script on how to evaluate the value of a query in the most generic form. Upload the script to us. We take this script and score all of their historical impression data. Then we learn from that data to bid optimally on future received queries.

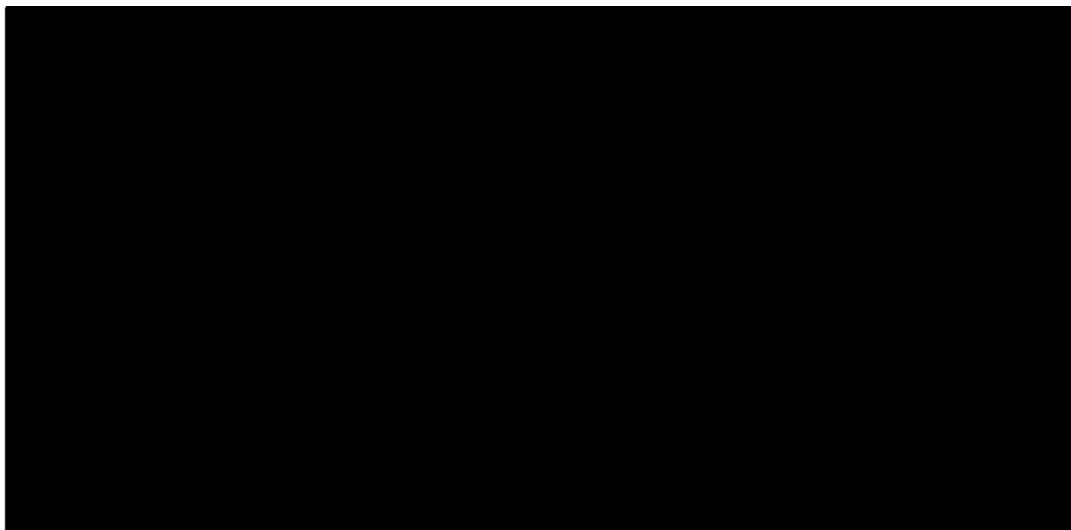
This a huge strategic investment for us because it allows us to enable agencies to bring their own secret sauce to auto-bidding. The nice thing about this is that there is no need for a huge investment on the advertiser's side – just bring the script.

**New Tech:  
Budget Optimization**

**Bid optimization subject to budget**



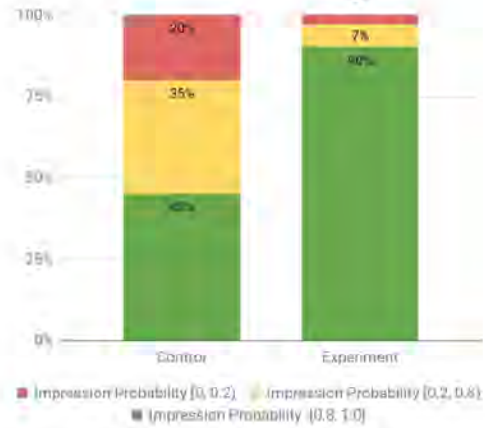
**Bid optimization subject to budget**



## Results for the revamped budget-based optimization

- Results for the new revamped budget-based bid optimization system improved over-all CPD by **10%** due to improved system design and lower end-to-end latency
- 1-Level simplified budget especially showed big reduction in budget throttling, and thus improving CPD by **40%** for maximize conversions
- With a concerted Sales effort, we plan to move as much spend as possible to the 1-level simplified budget mode

Changes to Impression Probability for 1-level simplified budget case



Clean 2p: bidding lower than value will result in lost impressions  
 Clearing price close to bid is a good indication that auction is unclean 2p

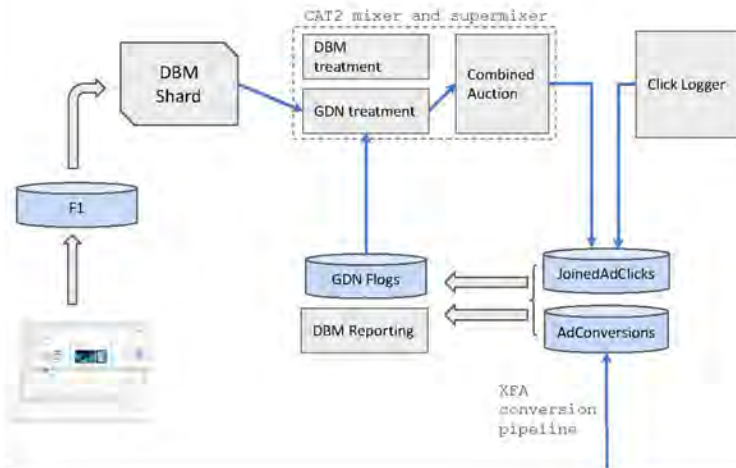
**New Class of Products:  
Outcome-Based Buying**



## Outcome-Based Buying

- Why Outcome-Based Buying?
  - Risk-free advertising
    - Lower risk for advertiser since they pay for their desired outcome (e.g., click, conversion, or ActiveView)
  - Relaxing the constraint on margin
    - Instead of a per impression fixed margin, the constraint becomes on average margin
    - Take a low margin if it helps to win competitive queries (and higher margin to offset on other queries)
  - Allowing data sharing
    - Having access to a large shared dataset allows for better, more consistent performance for all advertisers

## How It Works



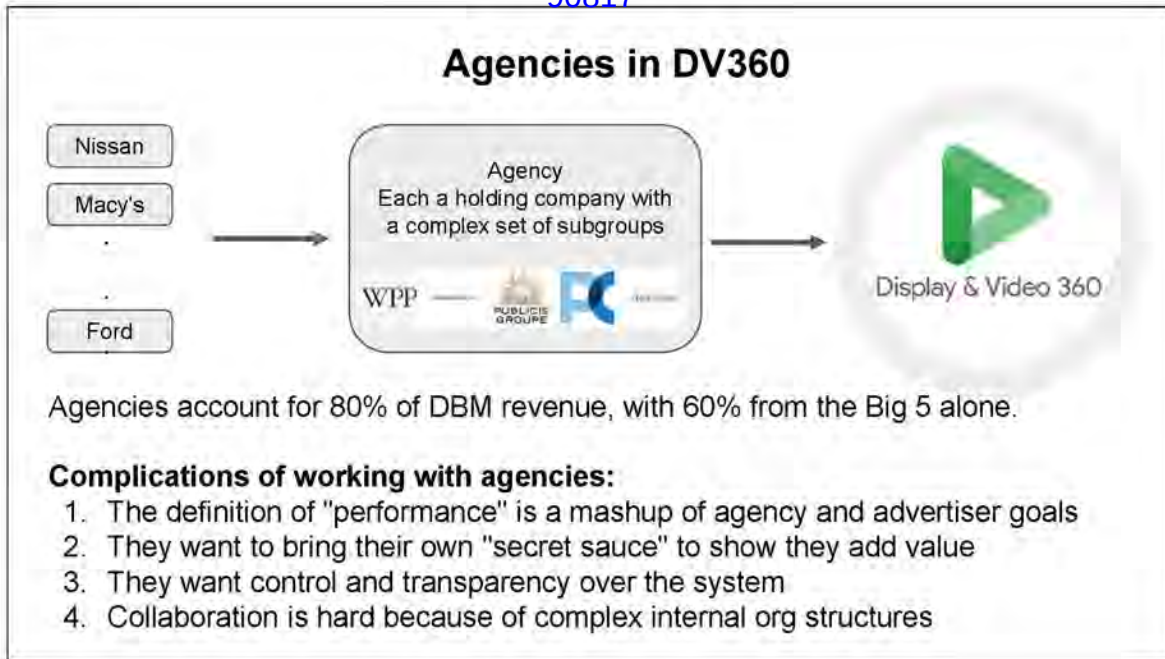
- First version offers click-based buying
- DBM Shard includes many business specific logic needed for DBM ads
- **GDN treatment** includes: GDN predictions and bidding models, Bernanke, etc
- Added DBM ads to GDN Flogs for model training
- DBM reporting looks into GDN logs for the first time

## What is coming next

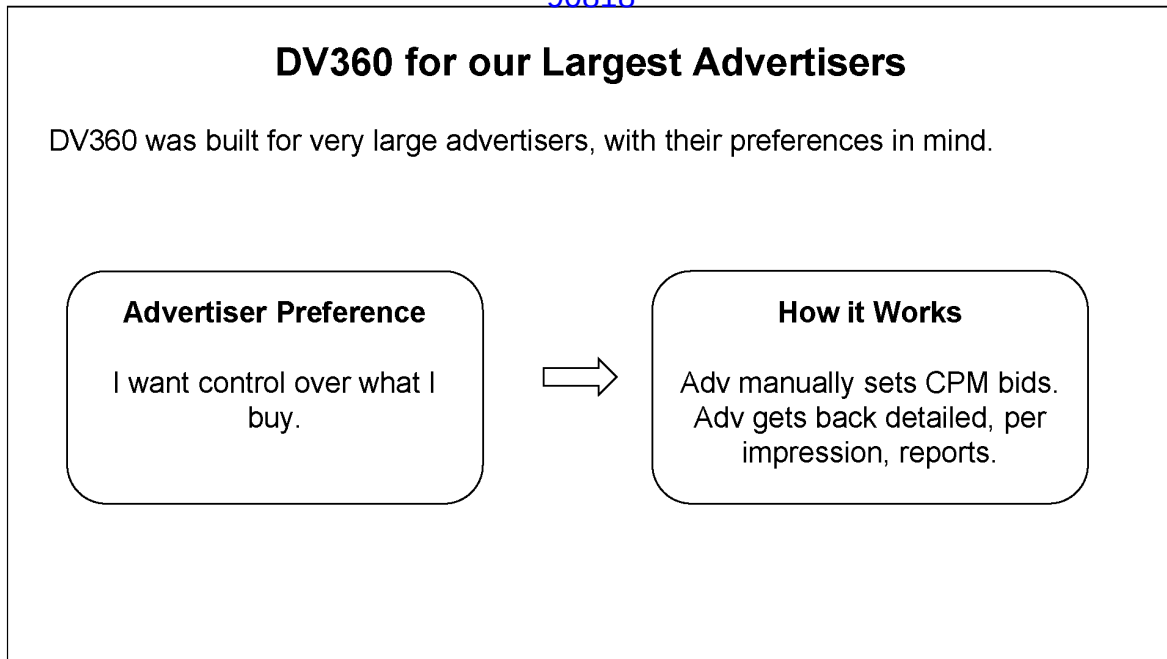
- Starting Alpha testing for
  - Rule-based custom bidding
    - Roll out to large advertisers and agencies
  - Outcome-based buying with target CPA and pay-per-click option
    - Plan to have 10% of DBM's spend on this product by end of 2019
- Further improvements on our core technologies
  
- Outcome-Based Buying as well as other planned improvements are expected to help us reach a goal of 60% automated bidding spend by end of 2019

## **Q&A**

**Appendix**



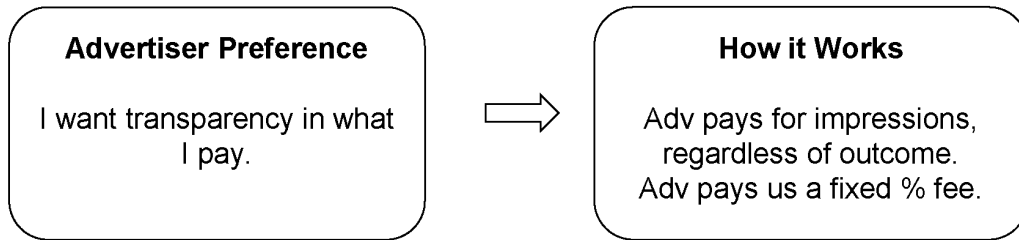
Remove text, booking and netflix as direct advertisers. Even large advertisers are sometimes direct.



Budget and third party inventory numbers from Rasta, month of September.  
Consider a stat to show head-heaviness if I can get one, i.e. Top N advertisers make up XX% of spend

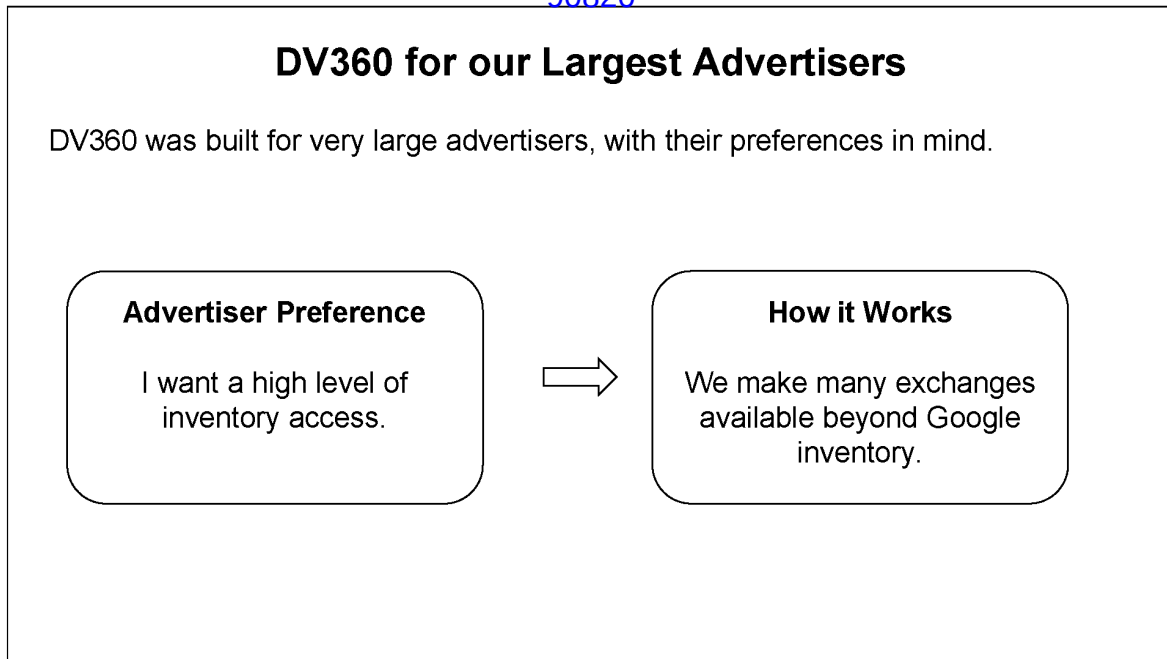
## DV360 for our Largest Advertisers

DV360 was built for very large advertisers, with their preferences in mind.

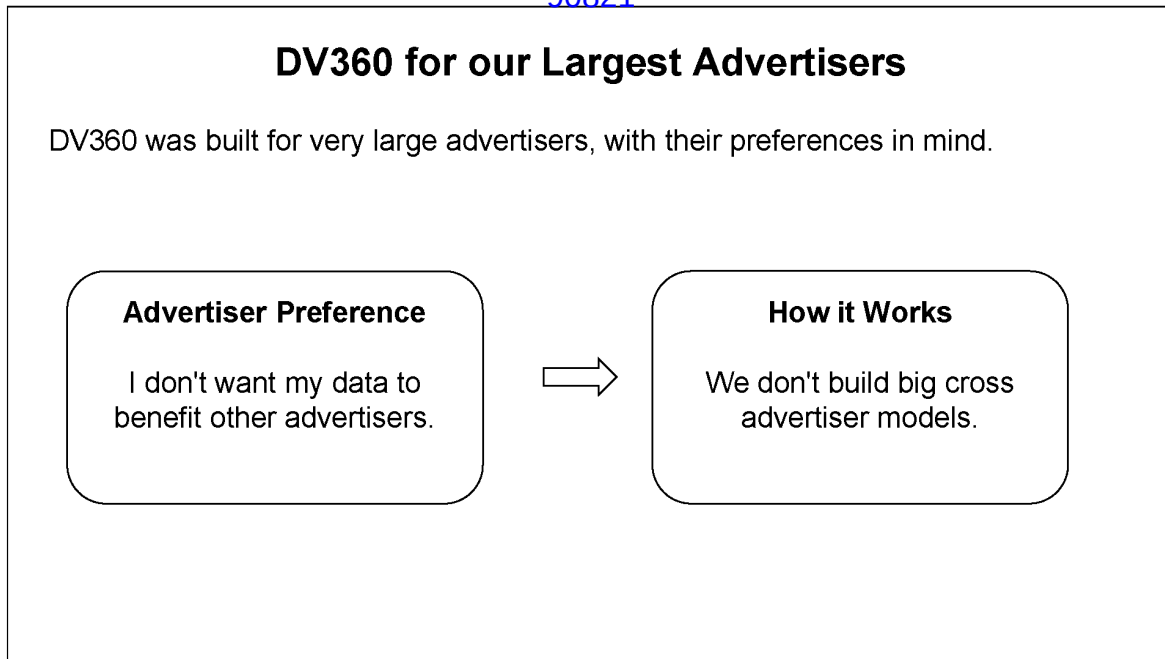


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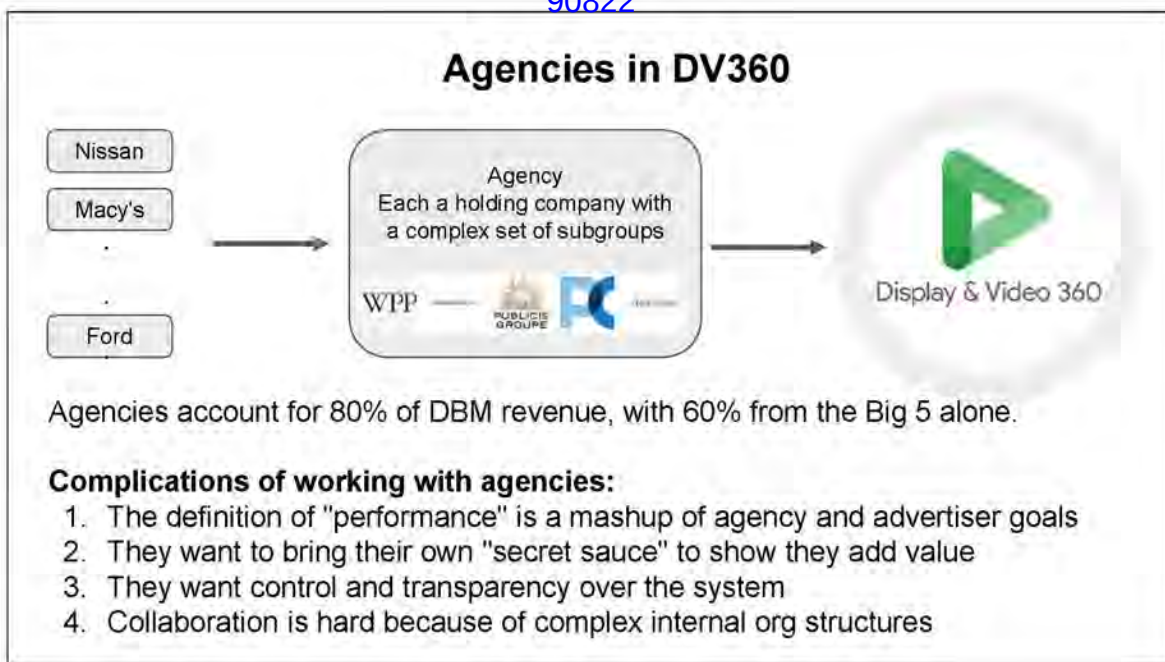




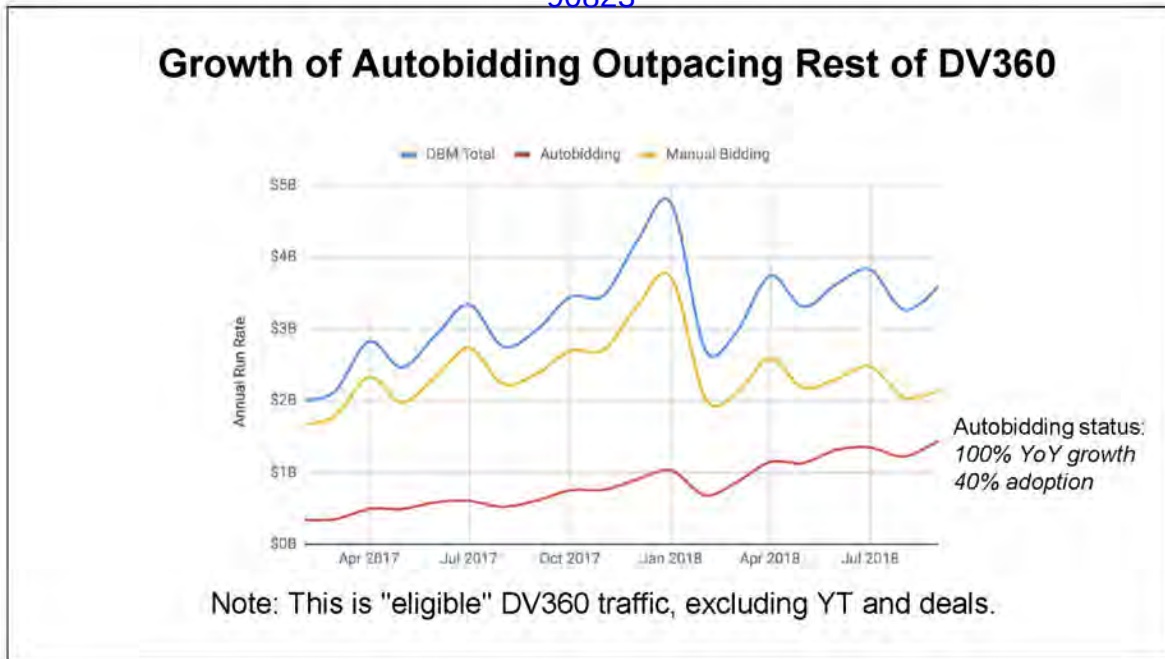
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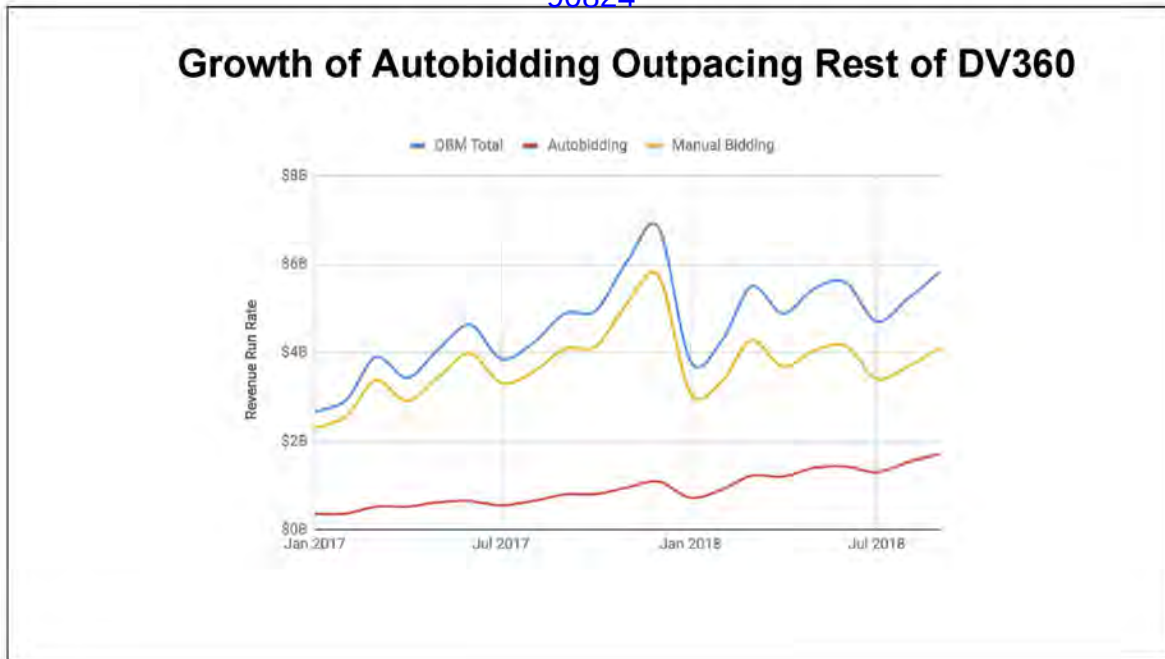
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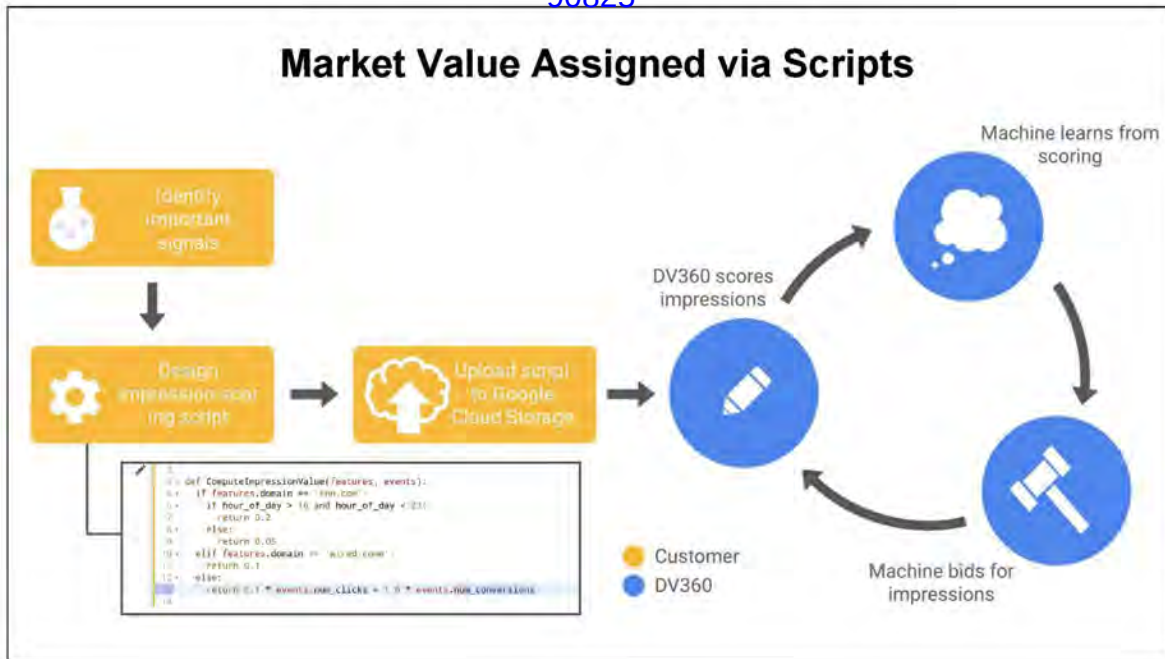
Remove text, booking and netflix as direct advertisers. Even large advertisers are sometimes direct.



2 years ago we reported 12% adoption, at around \$500M run rate. That's ~15% in today's accounting. We are at 40% now, and ~1.5B run rate.  
 Sheet with Casper's data.  
 Sheet with Nirmal's data.



2 years ago we reported 12% adoption, at around \$500M run rate. That's ~15% in today's accounting. We are at 40% now, and ~1.5B run rate.  
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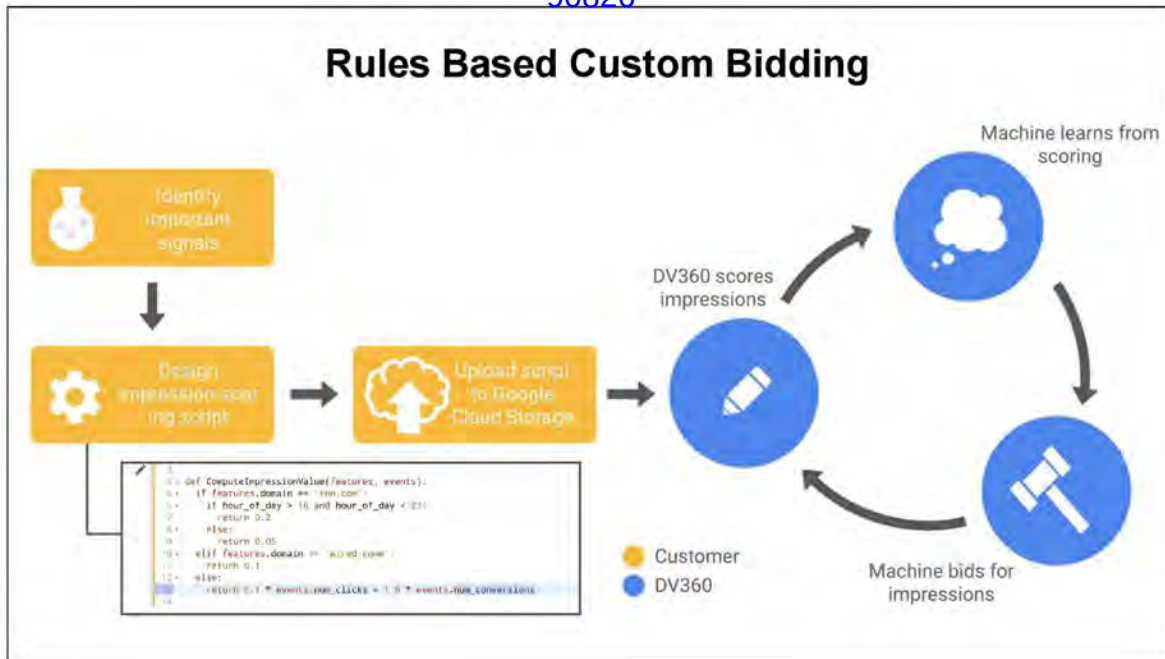
Agency wants Google to run code snippets online.

Why that's a really bad idea:

The obvious safety reasons plus:

We are really good at prediction and bidding.

Too much complexity within agencies to support such a relationship, even if a decent prototype was possible.



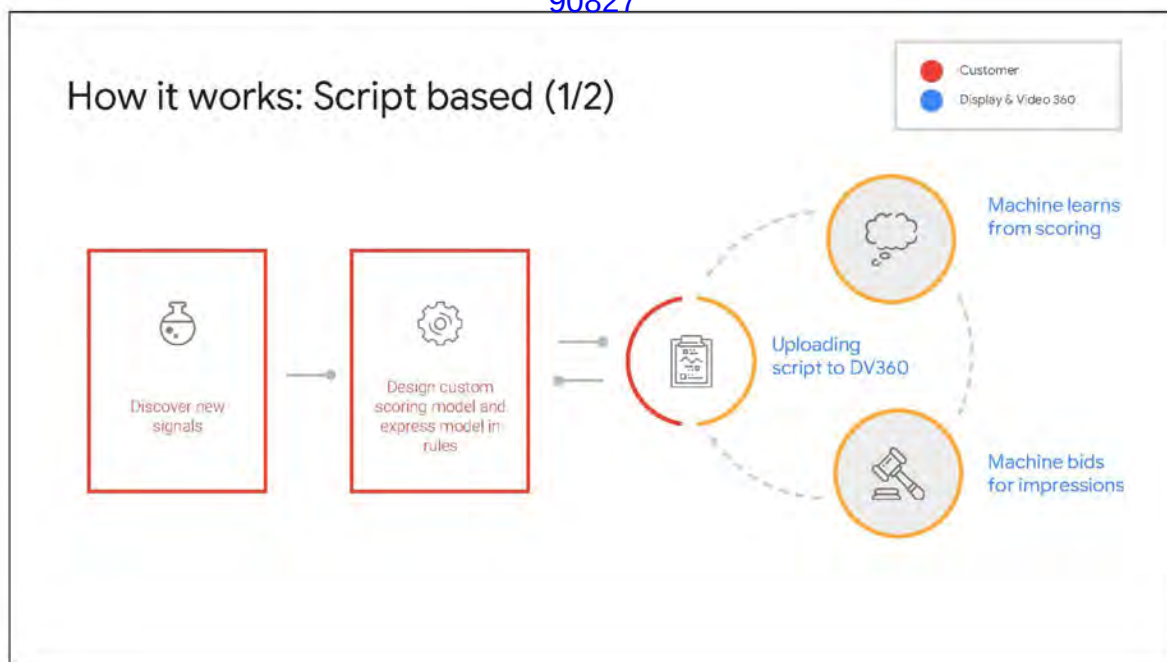
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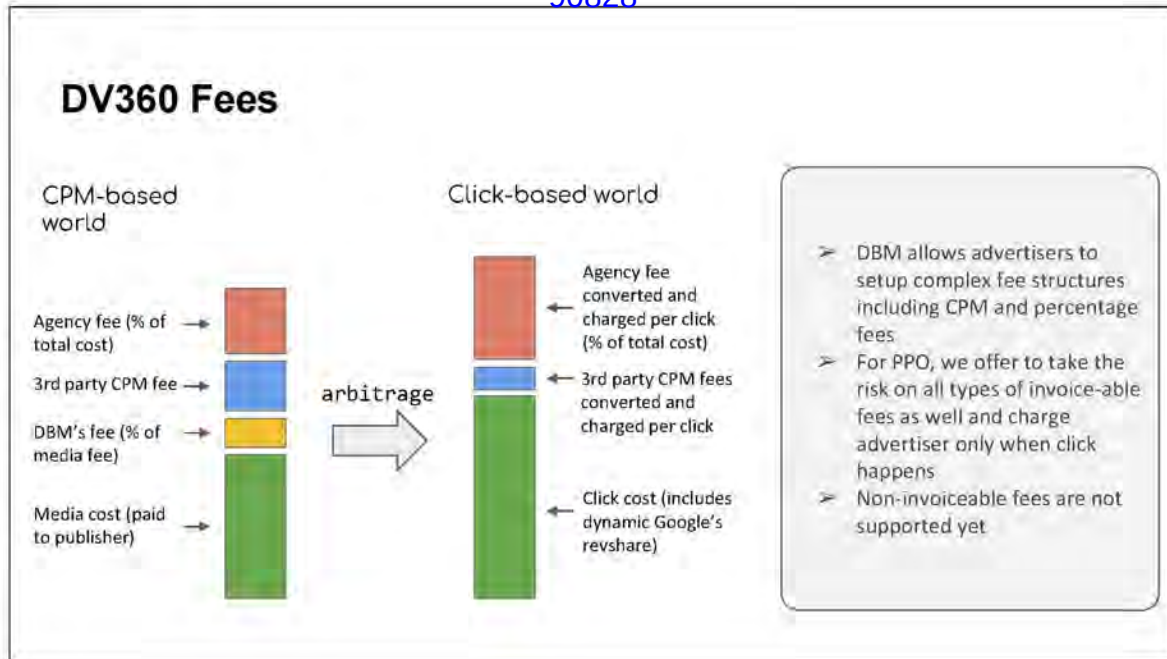
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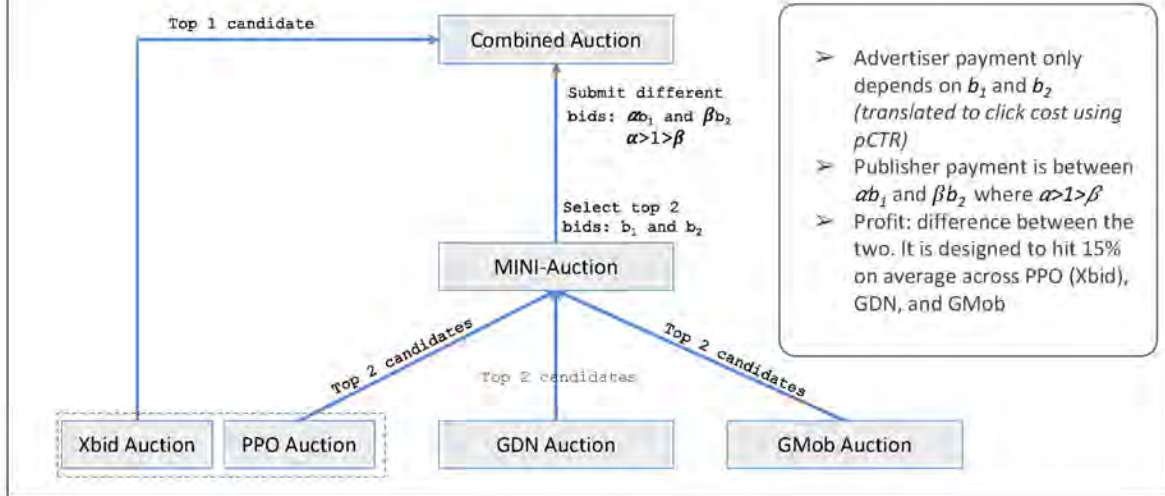
Too much complexity within agencies to support such a relationship, even if a decent prototype was possible.







## Auction



## How it will work: Script based (2/2)

Customers will be able to create "models" for assigning values to impressions based on a combination of:



Performance Metrics (e.g. clicks, active view etc.)



User signals (e.g. user list etc.)



Contextual signals (e.g. website/app, time of day etc.)

Advertisers will be able to create up to N models:



For example, an advertiser could create models like "Upper funnel", "Mid funnel", "Mobile" etc...

- Each "model" will be a collection of rules
- Advertisers can then upload these models to Display & Video 360 either via the UI or via the GCS buckets
- At the time of line item or insertion order creation, the advertiser will be able to select a "model" for optimization

## Example script based algorithm

Each model can be represented as a script in Display & Video 360. The script will generate a value for every impression.

### Use case example 1: Brand Signals

#### Goal

Optimize towards viewable impressions that happened on premium sites/apps

#### Model

A script with the following rules:

- If impression was viewable && URL was part of channel "Premium", then 10
- If impression was viewable && URL is not part of channel "Premium", then 5
- If impression was not viewable, then 0

### Use case example 2: Mid-Funnel Marketing

#### Goal

Optimize towards mid-funnel success metrics

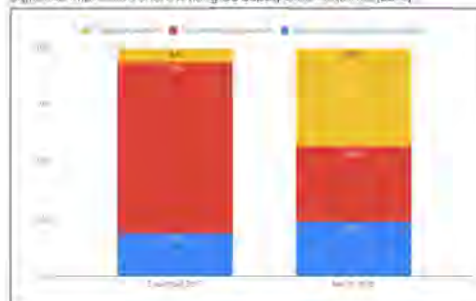
#### Model

$1 * \text{active\_view} + 5 * \text{click} +$   
 $10 * \text{conversion\_add\_to\_cart} +$   
 $100 * \text{conversion\_online\_sale}$

## Market shift to first price

- In fact, exchanges are openly moving more and more to first price auctions.
- This is necessary for them in order to compete in the header bidding auction controlled by publishers (first price).
- Buyer platforms must adapt and protect advertisers from overpaying.

Digital ad impression share among US Supply-Side Platforms (SSPs)



3PE provided auction type	DBM impression count (Aug 2018)
unspecified	45.6%
first price	30.8%
second price	23.5%

### Sources:

<https://www.emarketer.com/content/nearly-half-of-programmatic-impressions-are-sold-through-first-price-auctions>  
<https://pubmatic.com/wp-content/uploads/2017/08/PubMatic-UnderstandingAuctionDynamics.pdf>

## First price auctions

WIP need a graphic instead?

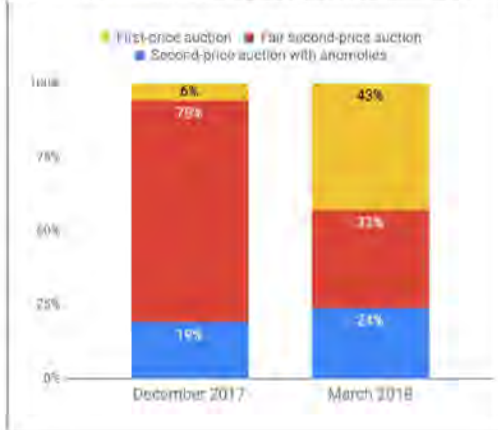
- One selling point of DV360 is that it enables advertisers to buy in many exchanges besides Google's AdX.
- Many of those exchanges sell a portion of their inventory via first priced auctions.
- In a second price auction, the advertiser can bid the value it places on the impression without fear of overpaying.
- In a first price auction, the advertiser may want to bid lower in some cases, as they can still win those impressions but pay less.

Clean 2p: bidding lower than value will result in lost impressions  
Clearing price close to bid is a good indication that auction is unclean 2p

## Market shift to first price

- In fact, exchanges are openly moving more and more to first price auctions.
- This is a simplification from recent trends to more and more opaque "2nd-price-like" auctions.
- Buyer platforms must adapt and protect advertisers from overpaying.

Digital Ad Impression Share Among U.S. Supply-Side-Platforms (SSPs)

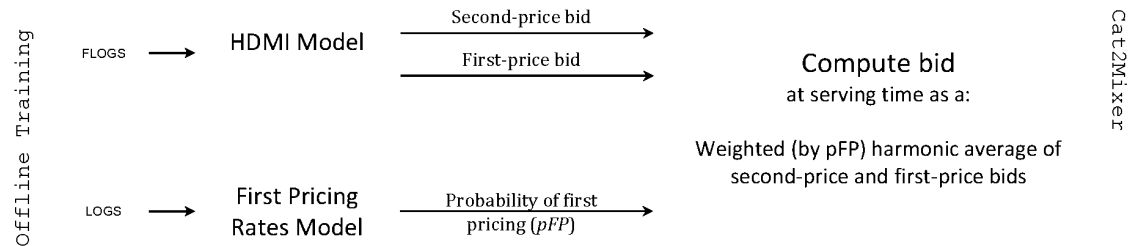


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<https://pubmatic.com/wp-content/uploads/2017/08/PubMatic-UnderstandingAuctionDynamics.pdf>

## A New Solution

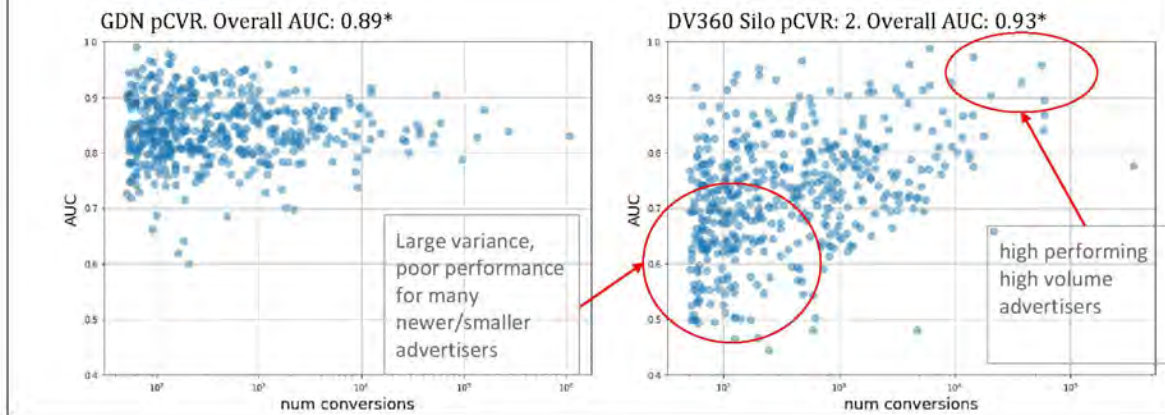
- Our bidding system, HDMI, was upgraded to compute bids for first price auction.
- We two bids to serving, one for first price and one for second price, and decide how to bid based on the exchange's auction type.

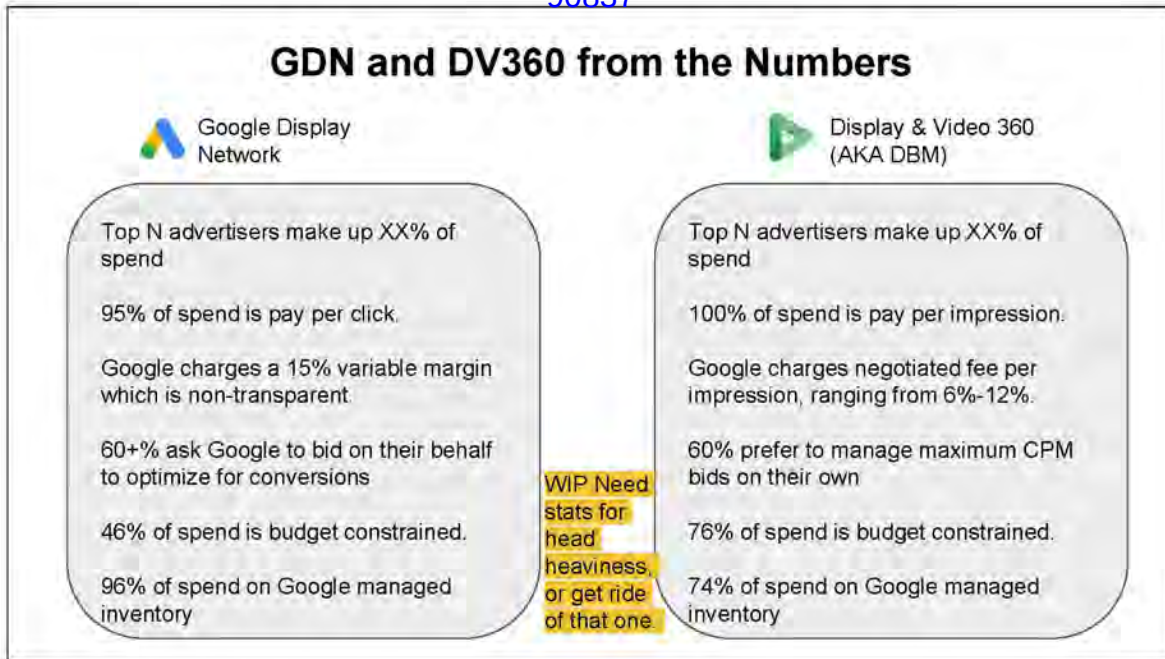




## Large scale ML with shared data

- Data sharing allows ML prediction models to be able to train on a large data set and provide better, more uniform experience to all advertisers





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Consider a stat to show head-heaviness if I can get one, i.e. Top N advertisers make up XX% of spend

## Autobidding Complexities in DBM

### Typical Autobidding Problem

*"Maximize conversions subject to my target CPA, please."*

### What Agencies Actually Want

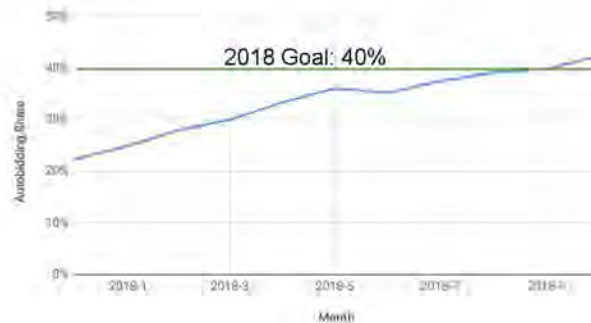
*"Get me **good enough** performance in terms of a **custom metric** we only track internally, while achieving a **list of constraints** (e.g. minimum viewability rate) which are actually **contractual obligations**, and make sure to bid above the floor in every private auction. Oh, and no matter what definitely **spend the budget**."*

In fact the first goal is so ubiquitous in GDN that we can essentially optimize for conversions even when the advertiser doesn't give us a formal goal.  
Right now the agencies accomplish this with teams of human traders / optimizers.

## We are driving adoption despite these challenges!

- Two years ago in this summit, around the end of Skyray, we reported 15% adoption and ~\$500M run rate.
- Today we are at 40% with a **\$1.5B run rate**.

WIP Need a flashier ch



2 years ago we reported 12% adoption, at around \$500M run rate. That's ~15% in today's accounting. We are at 40% now, and ~1.5B run rate.  
Sheet with Casper's data.  
Sheet with Nirmal's data.  
Agency stats?

## **How are we doing it?**

**Product Innovation**

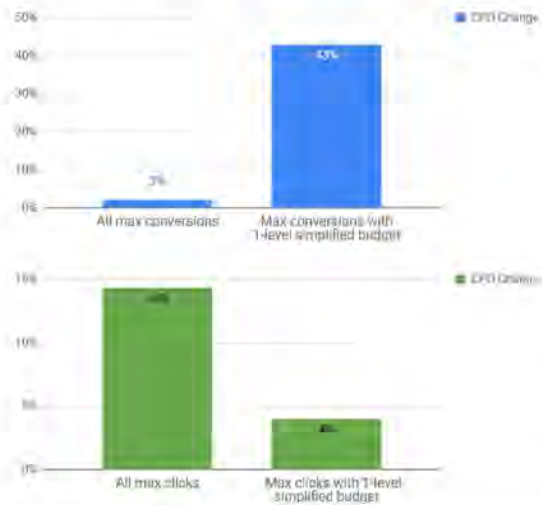
**Technology Innovation**

**Prove that our performance improvements can't be ignored.**

H2H tests.

## Results for the revamped budget-based optimization

- Results for the new revamped budget-based bid optimization system showed improvements due to improved system design and lower end-to-end latency
- 1-Level simplified budget especially showed big improvements for maximize conversions
- With a concerted Sales effort, we plan to move as much spend as possible to the 1-level simplified budget mode



Clean 2p: bidding lower than value will result in lost impressions  
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## **How are we doing it?**

### **Product Innovation**

- Offer more flexibility in how advertisers value the market
  - Optimize for high quality video views or "reached" users.
  - Allow agencies to send us custom code snippets to define a valuation of every impression
- Simplify other aspects of bidding
  - Work seamlessly with private auctions, other types of deals
  - Bid optimally given complex fee structures, deprecate ones that don't make sense
  - CampaignGroup (IO) Level Optimization, which optimally allocates budgets across campaigns.
- Show off what's under the hood
  - KIR team building a "Bidding Insights" product in the front end

### **Technology Innovation**

**Prove that our performance improvements can't be ignored.**

H2H tests.

## How are we doing it?

### Product Innovation

### Technology Innovation

- 2017: Moved to HDMI for Bidding and PEAR Army for Prediction
  - TODO(eric): stats
- 2018: Long list of HDMI and Prediction Improvements
  - TODO(eric): stats for top launches
- New: Smarter Bidding in First Price Auctions
  - TODO(eric): stats
- New: Completely Revamped System for Optimizing to Budgets
  - TODO(eric): stats

**Prove that our performance improvements can't be ignored.**

H2H tests.



## How are we doing it?

### Product Innovation

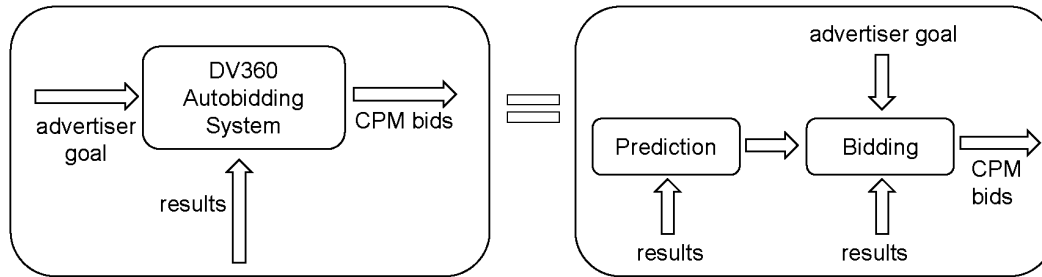
### Technology Improvements

#### **Prove that our performance improvements can't be ignored.**

- We encouraged advertisers to run H2H tests to show how much we can improve their performance.
  - Nissan: +102% clicks
  - Google Marketing: +47% clicks
  - Nissan: +78% conversions
  - Macy's: +71% conversions
  - Sky UK: +181% conversions
  - StubHub: +41% conversions

Note that we have spoken a lot about agencies but we still need to support traditional directs.

## Autobidding with Best in Class Technology



Prediction: PEAR Army, in-house ML system for siloed models

- Launch impact +60% value at same spend since 2017

Bidding: HDMI, with enhancements for DV360

- Launch impact +XX% value at same spend since 2017

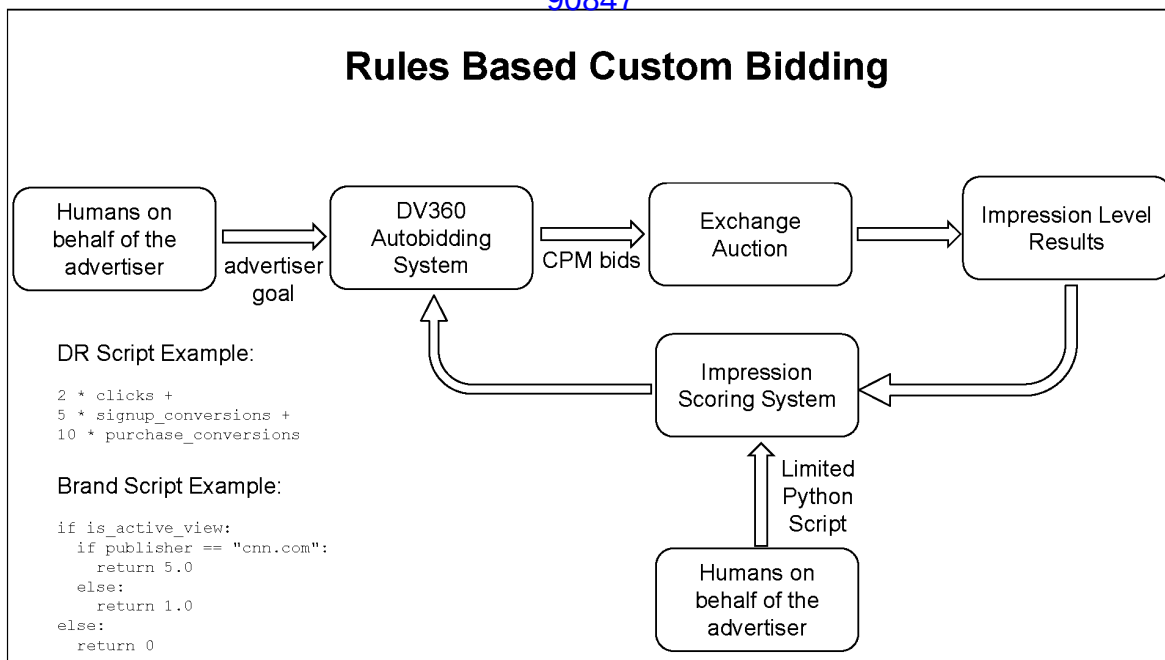
## Flexibility in Defining Advertiser Value

Our most popular autobidding products take the form:

*maximize advertiser value (V) subject to a budget*

### Choices for "V"

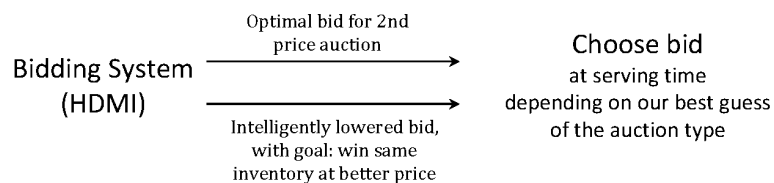
Advertising Goal	Existing in DV360	WIP for DV360	In the Dreams of a Sophisticated Advertiser
<i>Direct Response</i>	Clicks, Conversions	Incremental Conversions	<pre>2 * clicks + 5 * signup_conversions + 10 * purchase_conversions</pre>
<i>Brand</i>	Completed Videos Views	"Reached" Users	<pre>if is_active_view:     if publisher == "cnn.com":         return 5.0     else:         return 1.0 else:     return 0</pre>



## **New Tech: Intelligent Bidding in First Price Auctions**

## Poirot for Auto-bidding

- Optimal bidding looks very different in a first price auction - Poirot was our solution to protect manual bidders from non-second price auctions.
- This quarter we launched a version of Poirot for autobidding that works in tandem with HDMI.



**Result: +5%** conversions for advertisers, **+\$40M** net revenue to Google.